



US-162
SEQUENCE LISTING

<110> Yumi Matsuzaki, Jun Nakamura and Kenichi Hashiguchi
<120> Method for producing L-arginine or L-lysine by fermentation
<130> US-162
<140> US/10/790,224
<141> 2004-03-02
<150> JP 2003-056129
<151> 2003-03-03
<160> 24
<170> PatentIn Ver. 2.0

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<223> Description of Artificial Sequence: primer

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<222> (1852)..(2364)

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5 10 15
act gca cgc caa gct ctc att ttg cag att ttg gac aaa caa aaa gtc 1953

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<213> Brevibacterium flavum

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 35          40          45
Ile Asp Ile Thr Gln Ala Thr Leu Ser Arg Asp Leu Asp Glu Leu Gly
 50          55          60
Ala Arg Lys Val Arg Pro Asp Gly Gly Arg Ala Tyr Tyr Ala Val Gly
 65          70          75          80
Pro Val Asp Ser Ile Ala Arg Glu Asp Leu Arg Gly Pro Ser Glu Lys
          85          90          95
Leu Arg Arg Met Leu Asp Glu Leu Leu Val Ser Thr Asp His Ser Gly
100          105          110
Asn Ile Ala Met Leu Arg Thr Pro Pro Gly Ala Ala Gln Tyr Leu Ala
115          120          125
Ser Phe Ile Asp Arg Val Gly Leu Lys Glu Val Val Gly Thr Ile Ala
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<210> 17

<211> 3138

<212> DNA

<213> Brevibacterium lactofermentum

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<221> CDS

<222> (1)..(3138)

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Asp Pro Leu Pro Lys Val Gly Ser Leu Ser Leu Lys Ser Glu His Ala
          20          25          30
caa gca gat cta gag cat ttg ggt tgg cgc aat gtt gag tct ttg gat 144
Gln Ala Asp Leu Glu His Leu Gly Trp Arg Asn Val Glu Ser Leu Asp
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Leu	Gln	Ile	Gln	Ser	Leu	His	Ser	Gln	Leu	Phe	Tyr	Arg	Pro	Leu	Leu	
		515					520					525				
aac	tct	gtg	gtc	aac	ttg	agc	gcg	gat	gcc	atc	aga	ttg	tct	ccg	gat	1632
Asn	Ser	Val	Val	Asn	Leu	Ser	Ala	Asp	Ala	Ile	Arg	Leu	Ser	Pro	Asp	
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gct	gca	aag	cta	caa	ttg	ggg	gca	ttg	gga	tac	ctg	cat	cca	tca	cgt	1680
Ala	Ala	Lys	Leu	Gln	Leu	Gly	Ala	Leu	Gly	Tyr	Leu	His	Pro	Ser	Arg	
				550					555						560	
gct	tat	gaa	cac	ctg	act	gct	ctt	gca	tca	gga	gct	agc	cgt	aaa	gcc	1728
Ala	Tyr	Glu	His	Leu	Thr	Ala	Leu	Ala	Ser	Gly	Ala	Ser	Arg	Lys	Ala	
				565					570					575		
aag	att	cag	gcg	atg	ttg	ctg	ccc	acg	ttg	atg	gag	tggt	ctg	tct	caa	1776
Lys	Ile	Gln	Ala	Met	Leu	Leu	Pro	Thr	Leu	Met	Glu	Trp	Leu	Ser	Gln	
			580					585					590			
aca	gct	gaa	cca	gat	gcg	gga	ttg	ctg	aat	tac	cgc	aag	ctt	tct	gat	1824
Thr	Ala	Glu	Pro	Asp	Ala	Gly	Leu	Leu	Asn	Tyr	Arg	Lys	Leu	Ser	Asp	
		595				600						605				
gct	tcc	tat	gat	cgc	agc	tggt	ttt	ttg	cgc	atg	ctg	cgt	gat	gag	ggc	1872
Ala	Ser	Tyr	Asp	Arg	Ser	Trp	Phe	Leu	Arg	Met	Leu	Arg	Asp	Glu	Gly	
		610				615					620					
gta	gtg	ggg	cag	cgg	ttg	atg	cgt	att	ttg	gga	aat	tct	ccc	tat	att	1920
Val	Val	Gly	Gln	Arg	Leu	Met	Arg	Ile	Leu	Gly	Asn	Ser	Pro	Tyr	Ile	
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Ser	Glu	Leu	Ile	Ile	Ser	Thr	Pro	Asp	Phe	Val	Lys	Gln	Leu	Gly	Asp	
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gcg	gcg	tct	ggt	cct	aaa	ttg	ctt	gct	act	gca	ccg	act	cag	ggt	gtg	2016
Ala	Ala	Ser	Gly	Pro	Lys	Leu	Leu	Ala	Thr	Ala	Pro	Thr	Gln	Val	Val	
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Lys	Ala	Ile	Lys	Ala	Thr	Val	Ser	Arg	His	Glu	Ser	Pro	Asp	Arg	Ala	
		675					680					685				
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Ile	Gln	Ala	Ala	Arg	Ser	Leu	Arg	Arg	Gln	Glu	Leu	Ala	Arg	Ile	Ala	
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Ser	Ala	Asp	Leu	Leu	Asn	Met	Leu	Thr	Val	Gln	Glu	Val	Cys	Gln	Ser	
705					710				715					720		
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Leu	Ser	Leu	Val	Trp	Asp	Ala	Val	Leu	Asp	Ala	Ala	Leu	Asp	Ala	Glu	
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atc	cgt	gct	gca	ctt	aac	gat	cca	cag	aaa	cca	gat	cag	cct	ctg	gcc	2256
Ile	Arg	Ala	Ala	Leu	Asn	Asp	Pro	Gln	Lys	Pro	Asp	Gln	Pro	Leu	Ala	
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Asn	Ile	Ser	Val	Ile	Gly	Met	Gly	Arg	Leu	Gly	Gly	Ala	Glu	Leu	Gly	
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tac	ggt	tct	gat	gcc	gat	gtg	atg	ttt	gta	tgc	gag	ccg	gta	gcc	ggt	2352
Tyr	Gly	Ser	Asp	Ala	Asp	Val	Met	Phe	Val	Cys	Glu	Pro	Val	Ala	Gly	
	770					775				780						
gtg	gaa	gag	cat	gag	gcc	gtc	aca	tgg	tct	att	gcg	atc	tgt	gat	tcc	2400
Val	Glu	Glu	His	Glu	Ala	Val	Thr	Trp	Ser	Ile	Ala	Ile	Cys	Asp	Ser	
785					790				795					800		
atg	cgg	tcg	agg	ctt	gcg	cag	cct	tcc	ggt	gat	cca	cct	ttg	gag	gtg	2448
Met	Arg	Ser	Arg	Leu	Ala	Gln	Pro	Ser	Gly	Asp	Pro	Pro	Leu	Glu	Val	
				805					810					815		
gat	ctg	ggg	ctg	cgt	cct	gaa	ggg	aga	tct	ggt	gcg	att	gtg	cgc	acc	2496
Asp	Leu	Gly	Leu	Arg	Pro	Glu	Gly	Arg	Ser	Gly	Ala	Ile	Val	Arg	Thr	
			820					825				830				
gtt	gat	tcc	tat	gtg	aag	tac	tac	gaa	aag	tgg	ggt	gaa	act	tgg	gag	2544
Val	Asp	Ser	Tyr	Val	Lys	Tyr	Tyr	Glu	Lys	Trp	Gly	Glu	Thr	Trp	Glu	
		835					840					845				
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Ile	Gln	Ala	Leu	Leu	Arg	Ala	Ala	Trp	Val	Ala	Gly	Asp	Arg	Glu	Leu	
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Gly	Ile	Lys	Phe	Leu	Glu	Ser	Ile	Asp	Arg	Phe	Arg	Tyr	Pro	Val	Asp	
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ggg	gca	acg	cag	gcg	cag	ctt	cgt	gaa	gtt	cgt	cga	att	aag	gcg	agg	2688
Gly	Ala	Thr	Gln	Ala	Gln	Leu	Arg	Glu	Val	Arg	Arg	Ile	Lys	Ala	Arg	
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gtg	gat	aat	gag	agg	ctt	ccg	cgc	ggg	gct	gat	cga	aat	acc	cat	acc	2736
Val	Asp	Asn	Glu	Arg	Leu	Pro	Arg	Gly	Ala	Asp	Arg	Asn	Thr	His	Thr	
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Lys	Leu	Gly	Arg	Gly	Ala	Leu	Thr	Asp	Ile	Glu	Trp	Thr	Val	Gln	Leu	
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Leu	Thr	Met	Met	His	Ala	His	Glu	Ile	Pro	Glu	Leu	His	Asn	Thr	Ser		
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Thr	Leu	Glu	Val	Leu	Glu	Val	Leu	Glu	Lys	His	Gln	Ile	Ile	Asn	Pro		
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gtg	cag	gtg	cag	acg	ctt	cgg	gaa	gcg	tgg	ctg	acg	gca	acg	gct	gct	2928	
Val	Gln	Val	Gln	Thr	Leu	Arg	Glu	Ala	Trp	Leu	Thr	Ala	Thr	Ala	Ala		
				965					970					975			
agg	aat	gcg	ctt	gtg	ctg	gtc	agg	ggg	aag	aga	tta	gat	cag	tta	cct	2976	
Arg	Asn	Ala	Leu	Val	Leu	Val	Arg	Gly	Lys	Arg	Leu	Asp	Gln	Leu	Pro		
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Thr	Pro	Gly	Pro	His	Leu	Ala	Gln	Val	Ala	Gly	Ala	Ser	Gly	Trp	Asp		
		995					1000					1005					
cca	aat	gag	tac	cag	gag	tat	ttg	gaa	aac	tat	ctg	aaa	gtg	acc	agg	3072	
Pro	Asn	Glu	Tyr	Gln	Glu	Tyr	Leu	Glu	Asn	Tyr	Leu	Lys	Val	Thr	Arg		
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Lys	Ser	Arg	Gln	Val	Val	Asp	Glu	Val	Phe	Trp	Gly	Val	Asp	Ser	Met		
1025					1030					1035					1040		
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 <212> PRT
 <213> Brevibacterium lactofermentum

<400> 18

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Asp	Pro	Leu	Pro	Lys	Val	Gly	Ser	Leu	Ser	Leu	Lys	Ser	Glu	His	Ala		
			20					25					30				
Gln	Ala	Asp	Leu	Glu	His	Leu	Gly	Trp	Arg	Asn	Val	Glu	Ser	Leu	Asp		
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Leu	Leu	Trp	Gly	Leu	Ser	Gly	Ala	Gly	Asp	Pro	Asp	Val	Ala	Leu	Asn		
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Leu	Leu	Ile	Arg	Leu	Tyr	Gln	Ala	Leu	Glu	Ala	Ile	Gly	Glu	Asp	Ala		
65				70					75					80			
Arg	Asn	Glu	Leu	Asp	Gln	Glu	Ile	Arg	Gln	Asp	Glu	Glu	Leu	Arg	Val		
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Arg	Leu	Phe	Ala	Leu	Leu	Gly	Gly	Ser	Ser	Ala	Val	Gly	Asp	His	Leu		
			100					105					110				
Val	Ala	Asn	Pro	Leu	Gln	Trp	Lys	Leu	Leu	Lys	Leu	Asp	Ala	Pro	Ser		
		115					120					125					
Arg	Glu	Glu	Met	Phe	Gln	Ala	Leu	Leu	Glu	Ser	Val	Lys	Ala	Gln	Pro		
	130					135					140						
Ala	Val	Leu	Glu	Val	Glu	Asp	Phe	Ser	Asp	Ala	His	Asn	Ile	Ala	Arg		
145					150				155					160			
Asp	Asp	Leu	Ser	Thr	Pro	Gly	Phe	Tyr	Thr	Ala	Ser	Val	Thr	Gly	Pro		
				165					170					175			
Glu	Ala	Glu	Arg	Val	Leu	Lys	Trp	Thr	Tyr	Arg	Thr	Leu	Leu	Thr	Arg		
			180					185					190				
Ile	Ala	Ala	His	Asp	Leu	Ala	Gly	Thr	Tyr	Pro	Thr	Asp	Met	Arg	Arg		

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195				200				205							
Lys	Gly	Gly	Asp	Pro	Val	Pro	Phe	Ser	Thr	Val	Thr	Met	Gln	Leu	Ser
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Asp	Leu	Ala	Asp	Ala	Ala	Leu	Thr	Ala	Ala	Leu	Ala	Val	Ala	Ile	Ala
225	225	225	225	230	230	230	230	230	230	235	235	235	235	240	240
Asn	Val	Tyr	Gly	Glu	Lys	Pro	Val	Asp	Ser	Ala	Leu	Ser	Val	Ile	Ala
			245	245				250	250					255	
Met	Gly	Lys	Cys	Gly	Ala	Gln	Glu	Leu	Asn	Tyr	Ile	Ser	Asp	Val	Asp
			260	260			265	265				270	270		
Val	Val	Phe	Val	Ala	Glu	Pro	Ala	Asn	Ser	Lys	Ser	Thr	Arg	Thr	Ala
		275					280	280				285	285		
Ala	Glu	Leu	Ile	Arg	Ile	Gly	Ser	Asn	Ser	Phe	Phe	Glu	Val	Asp	Ala
290	290					295					300				
Ala	Leu	Arg	Pro	Glu	Gly	Lys	Ser	Gly	Ala	Leu	Val	Arg	Ser	Leu	Asp
305	305				310				315						320
Ser	His	Met	Ala	Tyr	Tyr	Lys	Arg	Trp	Ala	Glu	Thr	Trp	Glu	Phe	Gln
				325					330					335	
Ala	Leu	Leu	Lys	Ala	Arg	Pro	Met	Thr	Gly	Asp	Ile	Asp	Leu	Gly	Gln
			340					345					350		
Ser	Tyr	Val	Asp	Ala	Leu	Ser	Pro	Leu	Ile	Trp	Ala	Ala	Ser	Gln	Arg
		355					360					365			
Glu	Ser	Phe	Val	Thr	Asp	Val	Gln	Ala	Met	Arg	Arg	Arg	Val	Leu	Asp
370	370				375						380				
Asn	Val	Pro	Glu	Asp	Leu	Arg	Asp	Arg	Glu	Leu	Lys	Leu	Gly	Arg	Gly
385	385				390				395						400
Gly	Leu	Arg	Asp	Val	Glu	Phe	Ala	Val	Gln	Leu	Leu	Gln	Met	Val	His
			405					410						415	
Gly	Arg	Ile	Asp	Glu	Thr	Leu	Arg	Val	Arg	Ser	Thr	Val	Asn	Ala	Leu
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His	Val	Leu	Val	Asp	Gln	Gly	Tyr	Val	Gly	Arg	Glu	Asp	Gly	His	Asn
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Leu	Ile	Glu	Ser	Tyr	Glu	Phe	Leu	Arg	Leu	Leu	Glu	His	Arg	Leu	Gln
	450					455					460				
Leu	Glu	Arg	Ile	Lys	Arg	Thr	His	Leu	Leu	Pro	Lys	Pro	Asp	Asp	Arg
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Met	Asn	Met	Arg	Trp	Leu	Ala	Arg	Ala	Ser	Gly	Phe	Thr	Gly	Ser	Met
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Glu	Gln	Ser	Ser	Ala	Lys	Ala	Met	Glu	Arg	His	Leu	Arg	Lys	Val	Arg
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		515					520					525			
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	530					535					540				
Ala	Ala	Lys	Leu	Gln	Leu	Gly	Ala	Leu	Gly	Tyr	Leu	His	Pro	Ser	Arg
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Ala	Tyr	Glu	His	Leu	Thr	Ala	Leu	Ala	Ser	Gly	Ala	Ser	Arg	Lys	Ala
			565					570						575	
Lys	Ile	Gln	Ala	Met	Leu	Leu	Pro	Thr	Leu	Met	Glu	Trp	Leu	Ser	Gln
		580						585					590		
Thr	Ala	Glu	Pro	Asp	Ala	Gly	Leu	Leu	Asn	Tyr	Arg	Lys	Leu	Ser	Asp
	595					600						605			
Ala	Ser	Tyr	Asp	Arg	Ser	Trp	Phe	Leu	Arg	Met	Leu	Arg	Asp	Glu	Gly
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Val	Val	Gly	Gln	Arg	Leu	Met	Arg	Ile	Leu	Gly	Asn	Ser	Pro	Tyr	Ile
625	625				630					635					640

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Ser	Glu	Leu	Ile	Ile	Ser	Thr	Pro	Asp	Phe	Val	Lys	Gln	Leu	Gly	Asp
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Ala	Ala	Ser	Gly	Pro	Lys	Leu	Leu	Ala	Thr	Ala	Pro	Thr	Gln	Val	Val
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Lys	Ala	Ile	Lys	Ala	Thr	Val	Ser	Arg	His	Glu	Ser	Pro	Asp	Arg	Ala
		675					680					685			
Ile	Gln	Ala	Ala	Arg	Ser	Leu	Arg	Arg	Gln	Glu	Leu	Ala	Arg	Ile	Ala
	690					695					700				
Ser	Ala	Asp	Leu	Leu	Asn	Met	Leu	Thr	Val	Gln	Glu	Val	Cys	Gln	Ser
705					710					715					720
Leu	Ser	Leu	Val	Trp	Asp	Ala	Val	Leu	Asp	Ala	Ala	Leu	Asp	Ala	Glu
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Ile	Arg	Ala	Ala	Leu	Asn	Asp	Pro	Gln	Lys	Pro	Asp	Gln	Pro	Leu	Ala
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Asn	Ile	Ser	Val	Ile	Gly	Met	Gly	Arg	Leu	Gly	Gly	Ala	Glu	Leu	Gly
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Tyr	Gly	Ser	Asp	Ala	Asp	Val	Met	Phe	Val	Cys	Glu	Pro	Val	Ala	Gly
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Val	Glu	Glu	His	Glu	Ala	Val	Thr	Trp	Ser	Ile	Ala	Ile	Cys	Asp	Ser
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Gly	Ile	Lys	Phe	Leu	Glu	Ser	Ile	Asp	Arg	Phe	Arg	Tyr	Pro	Val	Asp
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Gly	Ala	Thr	Gln	Ala	Gln	Leu	Arg	Glu	Val	Arg	Arg	Ile	Lys	Ala	Arg
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Val	Asp	Asn	Glu	Arg	Leu	Pro	Arg	Gly	Ala	Asp	Arg	Asn	Thr	His	Thr
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Val	Gln	Val	Gln	Thr	Leu	Arg	Glu	Ala	Trp	Leu	Thr	Ala	Thr	Ala	Ala
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			980					985					990		
Thr	Pro	Gly	Pro	His	Leu	Ala	Gln	Val	Ala	Gly	Ala	Ser	Gly	Trp	Asp
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<212> DNA

<213> Brevibacterium lactofermentum

<220>

<221> CDS

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Gln	His	Phe	Ser	Ile	Pro	Ala	Ala	Ser	Phe	Asp	Ala	Asp	Thr	Val	Glu	
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Glu	Gly	Leu	Ala	Phe	Asp	Gly	Ser	Ser	Ile	Arg	Gly	Phe	Thr	Thr	Ile	
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Asp	Glu	Ser	Asp	Met	Asn	Leu	Leu	Pro	Asp	Leu	Gly	Thr	Ala	Thr	Leu	
	65				70				75						80	
gat	cca	ttc	cgc	aag	gca	aag	acc	ctg	aac	gtt	aag	ttc	ttc	gtt	cac	288
Asp	Pro	Phe	Arg	Lys	Ala	Lys	Thr	Leu	Asn	Val	Lys	Phe	Phe	Val	His	
				85					90					95		
gat	cct	ttc	acc	cgc	gag	gca	ttc	tcc	cgc	gac	cca	cgc	aac	gta	gca	336
Asp	Pro	Phe	Thr	Arg	Glu	Ala	Phe	Ser	Arg	Asp	Pro	Arg	Asn	Val	Ala	
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Arg	Lys	Ala	Glu	Gln	Tyr	Leu	Ala	Ser	Thr	Gly	Ile	Ala	Asp	Thr	Cys	
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Trp	Trp	Asn	Arg	Gly	Lys	Glu	Thr	Asn	Leu	Asp	Gly	Thr	Pro	Asn	Leu	
			165						170					175		
ggc	gca	aag	aac	cgc	gtc	aag	ggt	ggc	tac	ttc	cca	gta	gca	cca	tac	576
Gly	Ala	Lys	Asn	Arg	Val	Lys	Gly	Gly	Tyr	Phe	Pro	Val	Ala	Pro	Tyr	
			180					185					190			
gac	caa	acc	gtt	gac	gtg	cgc	gat	gac	atg	gtt	cgc	aac	ctc	gca	gct	624
Asp	Gln	Thr	Val	Asp	Val	Arg	Asp	Asp	Met	Val	Arg	Asn	Leu	Ala	Ala	
			195				200					205				
tcc	ggc	ttc	gct	ctt	gag	cgt	ttc	cac	cac	gaa	gtc	ggt	ggc	gga	cag	672
Ser	Gly	Phe	Ala	Leu	Glu	Arg	Phe	His	His	Glu	Val	Gly	Gly	Gly	Gln	
	210					215					220					
cag	gaa	atc	aac	tac	cgc	ttc	aac	acc	atg	ctc	cac	gcg	gca	gat	gat	720
Gln	Glu	Ile	Asn	Tyr	Arg	Phe	Asn	Thr	Met	Leu	His	Ala	Ala	Asp	Asp	
	225				230					235					240	
atc	cag	acc	ttc	aag	tac	atc	atc	aag	aac	acc	gct	cgc	ctc	cac	ggc	768
Ile	Gln	Thr	Phe	Lys	Tyr	Ile	Ile	Lys	Asn	Thr	Ala	Arg	Leu	His	Gly	

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aag gct gca acc ttc atg cct aag cca ctg gct ggc gac aac ggt tcc	245	250	255	816
Lys Ala Ala Thr Phe Met Pro Lys Pro Leu Ala Gly Asp Asn Gly Ser	260	265	270	
ggc atg cac gct cac cag tcc ctc tgg aag gac ggc aag cca ctc ttc	275	280	285	864
Gly Met His Ala His Gln Ser Leu Trp Lys Asp Gly Lys Pro Leu Phe	290	295	300	
cac gat gag tcc ggc tac gca ggc ctg tcc gac atc gcc cgc tac tac	305	310	315	912
His Asp Glu Ser Gly Tyr Ala Gly Leu Ser Asp Ile Ala Arg Tyr Tyr	325	330	335	
atc ggc ggc atc ctg cac cac gca ggc gct gtt ctg gcg ttc acc aac	340	345	350	960
Ile Gly Gly Ile Leu His Ala Gly Ala Val Leu Ala Phe Thr Asn	355	360	365	
gca acc ctg aac tcc tac cac cgt ctg gtt cca ggc ttc gag gct cca	370	375	380	1008
Ala Thr Leu Asn Ser Tyr His Arg Leu Val Pro Gly Phe Glu Ala Pro	385	390	395	
atc aac ctg gtg tac tca cag cgc aac cgt tcc gct gct gtc cgt atc	400	405	410	1056
Ile Asn Leu Val Tyr Ser Gln Arg Asn Arg Ser Ala Ala Val Arg Ile	415	420	425	
cca atc acc gga tcc aac cca aag gca aag cgc atc gaa ttc cgc gct	430	435	440	1104
Pro Ile Thr Gly Ser Asn Pro Lys Ala Lys Arg Ile Glu Phe Arg Ala	445	450	455	
cca gac cca tca ggc aac cca tac ctg ggc ttc gca gcg atg atg atg	460	465	470	1152
Pro Asp Pro Ser Gly Asn Pro Tyr Leu Gly Phe Ala Ala Met Met Met	475	480	485	
gcc ggc ctc gac ggc atc aag aac cgc atc gag cca cac gct cca gtg	490	495	500	1200
Ala Gly Leu Asp Gly Ile Lys Asn Arg Ile Glu Pro His Ala Pro Val	505	510	515	
gac aag gac ctc tac gaa ctg cca cca gag gaa gct gca tcc att cca	520	525	530	1248
Asp Lys Asp Leu Tyr Glu Leu Pro Pro Glu Glu Ala Ala Ser Ile Pro	535	540	545	
cag gca cca acc tcc ctg gaa gca tcc ctg aag gca ctg cag gaa gac	550	555	560	1296
Gln Ala Pro Thr Ser Leu Glu Ala Ser Leu Lys Ala Leu Gln Glu Asp	565	570	575	
acc gac ttc ctc acc gag tct gac gtc ttc acc gag gat ctc atc gag	580	585	590	1344
Thr Asp Phe Leu Thr Glu Ser Asp Val Phe Thr Glu Asp Leu Ile Glu	595	600	605	
gcg tac atc cag tac aag tac gac aac gag atc tcc cca gtt cgc ctg	610	615	620	1392
Ala Tyr Ile Gln Tyr Lys Tyr Asp Asn Glu Ile Ser Pro Val Arg Leu	625	630	635	
cgc cca acc ccg cag gaa ttc gaa ttg tac ttc gac tgc taa	640	645	650	1434
Arg Pro Thr Pro Gln Glu Phe Glu Leu Tyr Phe Asp Cys	655	660	665	

<210> 20

<211> 477

<212> PRT

<213> Brevibacterium lactofermentum

<400> 20

Val	Ala	Phe	Glu	Thr	Pro	Glu	Glu	Ile	Val	Lys	Phe	Ile	Lys	Asp	Glu
1				5					10					15	
Asn	Val	Glu	Phe	Val	Asp	Val	Arg	Phe	Thr	Asp	Leu	Pro	Gly	Thr	Glu
		20						25					30		
Gln	His	Phe	Ser	Ile	Pro	Ala	Ala	Ser	Phe	Asp	Ala	Asp	Thr	Val	Glu

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		35					40					45					
Glu	Gly	Leu	Ala	Phe	Asp	Gly	Ser	Ser	Ile	Arg	Gly	Phe	Thr	Thr	Ile		
	50					55					60						
Asp	Glu	Ser	Asp	Met	Asn	Leu	Leu	Pro	Asp	Leu	Gly	Thr	Ala	Thr	Leu		
65					70					75					80		
Asp	Pro	Phe	Arg	Lys	Ala	Lys	Thr	Leu	Asn	Val	Lys	Phe	Phe	Val	His		
				85					90					95			
Asp	Pro	Phe	Thr	Arg	Glu	Ala	Phe	Ser	Arg	Asp	Pro	Arg	Asn	Val	Ala		
			100					105					110				
Arg	Lys	Ala	Glu	Gln	Tyr	Leu	Ala	Ser	Thr	Gly	Ile	Ala	Asp	Thr	Cys		
		115					120					125					
Asn	Phe	Gly	Ala	Glu	Ala	Glu	Phe	Tyr	Leu	Phe	Asp	Ser	Val	Arg	Tyr		
130						135					140						
Ser	Thr	Glu	Met	Asn	Ser	Gly	Phe	Tyr	Glu	Val	Asp	Thr	Glu	Glu	Gly		
145				150					155					160			
Trp	Trp	Asn	Arg	Gly	Lys	Glu	Thr	Asn	Leu	Asp	Gly	Thr	Pro	Asn	Leu		
				165				170						175			
Gly	Ala	Lys	Asn	Arg	Val	Lys	Gly	Gly	Tyr	Phe	Pro	Val	Ala	Pro	Tyr		
		180					185						190				
Asp	Gln	Thr	Val	Asp	Val	Arg	Asp	Asp	Met	Val	Arg	Asn	Leu	Ala	Ala		
		195					200					205					
Ser	Gly	Phe	Ala	Leu	Glu	Arg	Phe	His	His	Glu	Val	Gly	Gly	Gly	Gln		
210						215					220						
Gln	Glu	Ile	Asn	Tyr	Arg	Phe	Asn	Thr	Met	Leu	His	Ala	Ala	Asp	Asp		
225					230					235					240		
Ile	Gln	Thr	Phe	Lys	Tyr	Ile	Ile	Lys	Asn	Thr	Ala	Arg	Leu	His	Gly		
			245					250					255				
Lys	Ala	Ala	Thr	Phe	Met	Pro	Lys	Pro	Leu	Ala	Gly	Asp	Asn	Gly	Ser		
		260					265						270				
Gly	Met	His	Ala	His	Gln	Ser	Leu	Trp	Lys	Asp	Gly	Lys	Pro	Leu	Phe		
		275					280					285					
His	Asp	Glu	Ser	Gly	Tyr	Ala	Gly	Leu	Ser	Asp	Ile	Ala	Arg	Tyr	Tyr		
	290					295					300						
Ile	Gly	Gly	Ile	Leu	His	Ala	Gly	Ala	Val	Leu	Ala	Phe	Thr	Asn			
305					310				315					320			
Ala	Thr	Leu	Asn	Ser	Tyr	His	Arg	Leu	Val	Pro	Gly	Phe	Glu	Ala	Pro		
			325					330					335				
Ile	Asn	Leu	Val	Tyr	Ser	Gln	Arg	Asn	Arg	Ser	Ala	Ala	Val	Arg	Ile		
		340					345						350				
Pro	Ile	Thr	Gly	Ser	Asn	Pro	Lys	Ala	Lys	Arg	Ile	Glu	Phe	Arg	Ala		
		355					360					365					
Pro	Asp	Pro	Ser	Gly	Asn	Pro	Tyr	Leu	Gly	Phe	Ala	Ala	Met	Met	Met		
	370					375					380						
Ala	Gly	Leu	Asp	Gly	Ile	Lys	Asn	Arg	Ile	Glu	Pro	His	Ala	Pro	Val		
385					390					395					400		
Asp	Lys	Asp	Leu	Tyr	Glu	Leu	Pro	Pro	Glu	Glu	Ala	Ala	Ser	Ile	Pro		
			405						410					415			
Gln	Ala	Pro	Thr	Ser	Leu	Glu	Ala	Ser	Leu	Lys	Ala	Leu	Gln	Glu	Asp		
		420					425					430					
Thr	Asp	Phe	Leu	Thr	Glu	Ser	Asp	Val	Phe	Thr	Glu	Asp	Leu	Ile	Glu		
	435						440					445					
Ala	Tyr	Ile	Gln	Tyr	Lys	Tyr	Asp	Asn	Glu	Ile	Ser	Pro	Val	Arg	Leu		
	450					455					460						
Arg	Pro	Thr	Pro	Gln	Glu	Phe	Glu	Leu	Tyr	Phe	Asp	Cys					
465					470					475							

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<210> 21
 <211> 672
 <212> DNA
 <213> Brevibacterium lactofermentum

<220>
 <221> CDS
 <222> (1)..(669)

<400> 21
 atg gca gga gca gtg gga cgc ccc cgg aga tca gct ccg cga cgg gca 48
 Met Ala Gly Ala Val Gly Arg Pro Arg Arg Ser Ala Pro Arg Arg Ala
 1 5 10 15
 ggc aag aat cct cgc gag gag att ctt gac gcc tct gct gag ctt ttc 96
 Gly Lys Asn Pro Arg Glu Glu Ile Leu Asp Ala Ser Ala Glu Leu Phe
 20 25 30
 acc cat caa ggc ttc gca aca acc tcc acg cat caa atc gct gat gcc 144
 Thr His Gln Gly Phe Ala Thr Thr Ser Thr His Gln Ile Ala Asp Ala
 35 40 45
 gtg gga atc cgc caa gcc tcg ctg tat tat cac ttc ccg tct aag acg 192
 Val Gly Ile Arg Gln Ala Ser Leu Tyr Tyr His Phe Pro Ser Lys Thr
 50 55 60
 gaa atc ttc ctc acc ctc ctg aaa tct acc gtc gag ccg tcc act gtg 240
 Glu Ile Phe Leu Thr Leu Leu Lys Ser Thr Val Glu Pro Ser Thr Val
 65 70 75 80
 ctc gcc gaa gac tta agc atc ctg gat gca gga cct gag atg cgc ctc 288
 Leu Ala Glu Asp Leu Ser Ile Leu Asp Ala Gly Pro Glu Met Arg Leu
 85 90 95
 tgg gca atc gtt gcc tcc gaa gtg cgt ctg ctg ctg tcc acc aag tgg 336
 Trp Ala Ile Val Ala Ser Glu Val Arg Leu Leu Leu Ser Thr Lys Trp
 100 105 110
 aac gtc ggt cgc ctg tac caa ctc ccc atc gtt ggt tct gaa gag ttc 384
 Asn Val Gly Arg Leu Tyr Gln Leu Pro Ile Val Gly Ser Glu Glu Phe
 115 120 125
 gcc gag tac cac agc cag cgc gaa gcc ctc acc aac atc ttc cgc gac 432
 Ala Glu Tyr His Ser Gln Arg Glu Ala Leu Thr Asn Ile Phe Arg Asp
 130 135 140
 ctc gcc acc gaa atc gtc ggt gac gac ccc cgc gca gaa ctc ccc ttc 480
 Leu Ala Thr Glu Ile Val Gly Asp Asp Pro Arg Ala Glu Leu Pro Phe
 145 150 155 160
 cac atc acc atg tcg gtg atc gaa atg cgt cgc aac gac ggc aag att 528
 His Ile Thr Met Ser Val Ile Glu Met Arg Arg Asn Asp Gly Lys Ile
 165 170 175
 cca agc ccg ctt tcc gca gac agc ctc ccg gag acc gca att atg ctt 576
 Pro Ser Pro Leu Ser Ala Asp Ser Leu Pro Glu Thr Ala Ile Met Leu
 180 185 190
 gcc gac gcc tcc ctc gcc gtc ctc ggc gcg tcg ctg ccc gcc gac cgg 624
 Ala Asp Ala Ser Leu Ala Val Leu Gly Ala Ser Leu Pro Ala Asp Arg
 195 200 205
 gtc gaa aaa acg ctt gaa cta atc aag cag gct gac gcg aaa taa cca 672
 Val Glu Lys Thr Leu Glu Leu Ile Lys Gln Ala Asp Ala Lys
 210 215 220

<210> 22

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<211> 222
 <212> PRT
 <213> Brevibacterium lactofermentum

<400> 22
 Met Ala Gly Ala Val Gly Arg Pro Arg Arg Ser Ala Pro Arg Arg Ala
 1 5 10 15
 Gly Lys Asn Pro Arg Glu Glu Ile Leu Asp Ala Ser Ala Glu Leu Phe
 20 25 30
 Thr His Gln Gly Phe Ala Thr Thr Ser Thr His Gln Ile Ala Asp Ala
 35 40 45
 Val Gly Ile Arg Gln Ala Ser Leu Tyr Tyr His Phe Pro Ser Lys Thr
 50 55 60
 Glu Ile Phe Leu Thr Leu Leu Lys Ser Thr Val Glu Pro Ser Thr Val
 65 70 75 80
 Leu Ala Glu Asp Leu Ser Ile Leu Asp Ala Gly Pro Glu Met Arg Leu
 85 90 95
 Trp Ala Ile Val Ala Ser Glu Val Arg Leu Leu Leu Ser Thr Lys Trp
 100 105 110
 Asn Val Gly Arg Leu Tyr Gln Leu Pro Ile Val Gly Ser Glu Glu Phe
 115 120 125
 Ala Glu Tyr His Ser Gln Arg Glu Ala Leu Thr Asn Ile Phe Arg Asp
 130 135 140
 Leu Ala Thr Glu Ile Val Gly Asp Asp Pro Arg Ala Glu Leu Pro Phe
 145 150 155 160
 His Ile Thr Met Ser Val Ile Glu Met Arg Arg Asn Asp Gly Lys Ile
 165 170 175
 Pro Ser Pro Leu Ser Ala Asp Ser Leu Pro Glu Thr Ala Ile Met Leu
 180 185 190
 Ala Asp Ala Ser Leu Ala Val Leu Gly Ala Ser Leu Pro Ala Asp Arg
 195 200 205
 Val Glu Lys Thr Leu Glu Leu Ile Lys Gln Ala Asp Ala Lys
 210 215 220

<210> 23
 <211> 2076
 <212> DNA
 <213> Brevibacterium lactofermentum

<220>
 <221> CDS
 <222> (1)..(2076)

<400> 23
 atg aat aat cca gcc cag ctg cgc caa gat act gaa aag gaa gtc ctg 48
 Met Asn Asn Pro Ala Gln Leu Arg Gln Asp Thr Glu Lys Glu Val Leu
 1 5 10 15
 gcg ttg ctg ggc tct ttg gtt tta ccc gcc ggc acc gcg ctt gcc gcc 96
 Ala Leu Leu Gly Ser Leu Val Leu Pro Ala Gly Thr Ala Leu Ala Ala
 20 25 30
 acc gga tct ttg gcc agg tcc gaa ctc acg ccg tat tcc gat ttg gac 144
 Thr Gly Ser Leu Ala Arg Ser Glu Leu Thr Pro Tyr Ser Asp Leu Asp
 35 40 45
 ctc att ttg atc cat cca cca ggg gca acc ccg gat ggc gtg gag gat 192
 Leu Ile Leu Ile His Pro Pro Gly Ala Thr Pro Asp Gly Val Glu Asp

															US-162										
50					55					60															
ttg	tgg	tac	ccg	att	tgg	gac	gca	aaa	aag	cgc	ctc	gac	tac	tcc	gtg	240									
Leu	Trp	Tyr	Pro	Ile	Trp	Asp	Ala	Lys	Lys	Arg	Leu	Asp	Tyr	Ser	Val										
65					70					75					80										
cgc	acc	cca	gat	gag	tgc	gtg	gct	atg	att	tct	gcg	gat	tcc	act	gca	288									
Arg	Thr	Pro	Asp	Glu	Cys	Val	Ala	Met	Ile	Ser	Ala	Asp	Ser	Thr	Ala										
				85					90					95											
gcc	ctt	gcc	atg	ctt	gac	ctg	cga	ttt	att	gct	ggc	gat	gag	gat	ctg	336									
Ala	Leu	Ala	Met	Leu	Asp	Leu	Arg	Phe	Ile	Ala	Gly	Asp	Glu	Asp	Leu										
			100					105					110												
tgt	gcc	aaa	acg	cgc	cgg	cgc	atc	gtg	gag	aag	tgg	cgc	cag	gaa	ctc	384									
Cys	Ala	Lys	Thr	Arg	Arg	Arg	Ile	Val	Glu	Lys	Trp	Arg	Gln	Glu	Leu										
		115					120					125													
aac	aaa	aac	ttc	gac	gcc	gtt	gtg	gac	acc	gcg	att	gcc	cgt	tgg	cgc	432									
Asn	Lys	Asn	Phe	Asp	Ala	Val	Val	Asp	Thr	Ala	Ile	Ala	Arg	Trp	Arg										
	130					135					140														
cgc	tcc	gga	ccc	gtc	gtg	gca	atg	acg	cgg	cca	gat	ctt	aaa	cac	ggc	480									
Arg	Ser	Gly	Pro	Val	Val	Ala	Met	Thr	Arg	Pro	Asp	Leu	Lys	His	Gly										
145				150						155					160										
agg	gga	ggg	ctg	cgc	gat	ttc	gaa	ctg	atc	aag	gcc	ctc	gcg	ctc	ggc	528									
Arg	Gly	Gly	Leu	Arg	Asp	Phe	Glu	Leu	Ile	Lys	Ala	Leu	Ala	Leu	Gly										
			165					170						175											
cac	cta	tgc	aac	gtt	cca	cag	cta	gat	acg	caa	cac	cag	ctg	ctt	ctc	576									
His	Leu	Cys	Asn	Val	Pro	Gln	Leu	Asp	Thr	Gln	His	Gln	Leu	Leu	Leu										
			180					185					190												
gac	gcc	cgc	acc	ttg	ctg	cac	gtc	cac	gcg	cga	cgc	tcc	cgc	gac	gtc	624									
Asp	Ala	Arg	Thr	Leu	Leu	His	Val	His	Ala	Arg	Arg	Ser	Arg	Asp	Val										
		195					200					205													
ctt	gat	ccc	gaa	ttt	gcg	gtg	gat	gtg	gcc	atg	gat	ttg	ggc	ttt	gtt	672									
Leu	Asp	Pro	Glu	Phe	Ala	Val	Asp	Val	Ala	Met	Asp	Leu	Gly	Phe	Val										
	210					215					220														
gac	cgc	tat	cac	tta	ggc	cgg	gag	atc	gcc	gat	gca	gcc	cgc	gcc	att	720									
Asp	Arg	Tyr	His	Leu	Gly	Arg	Glu	Ile	Ala	Asp	Ala	Ala	Arg	Ala	Ile										
225				230					235						240										
gat	gac	ggc	ctg	acc	gcg	ctg	gcc	acc	gcc	cgt	ggc	att	ttg	cca		768									
Asp	Asp	Gly	Leu	Thr	Ala	Leu	Ala	Thr	Ala	Arg	Gly	Ile	Leu	Pro											
			245					250					255												
cgt	cgc	acg	ggc	ttt	gct	ttt	agg	aat	gct	tct	cga	cgc	cca	ctt	gat	816									
Arg	Arg	Thr	Gly	Phe	Ala	Phe	Arg	Asn	Ala	Ser	Arg	Arg	Pro	Leu	Asp										
			260					265					270												
ctt	gat	gtc	gtc	gac	gcc	aac	ggc	act	atc	gaa	ttg	tcc	aaa	aaa	cca	864									
Leu	Asp	Val	Val	Asp	Ala	Asn	Gly	Thr	Ile	Glu	Leu	Ser	Lys	Lys	Pro										
	275						280					285													
gat	ctt	aat	gat	ccc	gca	ctt	cca	ctt	cga	gtg	gcc	gca	gcc	gca	gcg	912									
Asp	Leu	Asn	Asp	Pro	Ala	Leu	Pro	Leu	Arg	Val	Ala	Ala	Ala	Ala	Ala										
	290					295					300														
acc	acc	gga	ctt	ccg	gtg	gca	gaa	tca	acc	tgg	gct	cga	ctt	aat	gaa	960									
Thr	Thr	Gly	Leu	Pro	Val	Ala	Glu	Ser	Thr	Trp	Ala	Arg	Leu	Asn	Glu										
305				310						315					320										
tgc	ccg	cca	ctt	cct	gag	cca	tgg	cct	gcc	aat	gca	gca	ggg	gac	ttc	1008									
Cys	Pro	Pro	Leu	Pro	Glu	Pro	Trp	Pro	Ala	Asn	Ala	Ala	Gly	Asp	Phe										
			325						330					335											
ttt	cgg	att	ctc	tcc	agt	ccg	aaa	aac	tca	cgc	cga	gtg	gtg	aaa	aat	1056									
Phe	Arg	Ile	Leu	Ser	Ser	Pro	Lys	Asn	Ser	Arg	Arg	Val	Val	Lys	Asn										
			340					345					350												

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atg	gat	cgc	cac	gga	ttg	tgg	tcg	cgt	ttt	gtt	cca	gaa	tgg	gac	cgc	1104
Met	Asp	Arg	His	Gly	Leu	Trp	Ser	Arg	Phe	Val	Pro	Glu	Trp	Asp	Arg	
		355					360					365				
atc	aaa	ggg	ctt	atg	ccc	cgt	gaa	ccc	agc	cat	att	tcc	acc	atc	gat	1152
Ile	Lys	Gly	Leu	Met	Pro	Arg	Glu	Pro	Ser	His	Ile	Ser	Thr	Ile	Asp	
	370					375					380					
gaa	cat	agt	ctg	aac	act	gtt	gca	gga	tgt	gcg	cta	gaa	act	gtg	acc	1200
Glu	His	Ser	Leu	Asn	Thr	Val	Ala	Gly	Cys	Ala	Leu	Glu	Thr	Val	Thr	
385					390					395					400	
gtc	gcg	cgc	ccc	gat	ctt	tta	gtt	ttg	gga	gcc	ttg	tac	cac	gac	att	1248
Val	Ala	Arg	Pro	Asp	Leu	Leu	Val	Leu	Gly	Ala	Leu	Tyr	His	Asp	Ile	
				405					410					415		
ggc	aag	ggc	ttc	ccg	cgt	cca	cac	gaa	caa	gta	ggt	gca	gag	atg	gtg	1296
Gly	Lys	Gly	Phe	Pro	Arg	Pro	His	Glu	Gln	Val	Gly	Ala	Glu	Met	Val	
			420					425					430			
gcg	agg	gcc	gcg	agc	cgc	atg	ggg	ttg	aac	ctt	cgc	gat	cgt	gcc	agc	1344
Ala	Arg	Ala	Ala	Ser	Arg	Met	Gly	Leu	Asn	Leu	Arg	Asp	Arg	Ala	Ser	
		435					440					445				
gtg	caa	acg	ctg	gtc	gcc	gag	cac	acc	gcg	gtg	gcc	aaa	atc	gcc	gcg	1392
Val	Gln	Thr	Leu	Val	Ala	Glu	His	Thr	Ala	Val	Ala	Lys	Ile	Ala	Ala	
	450					455					460					
cgc	ctt	gat	ccc	tcc	tcg	gag	ggc	gcc	gtc	gat	aag	ctg	ctt	gat	gct	1440
Arg	Leu	Asp	Pro	Ser	Ser	Glu	Gly	Ala	Val	Asp	Lys	Leu	Leu	Asp	Ala	
465					470					475					480	
gtt	agg	tat	gac	ctg	gtg	aca	ttg	aat	ctg	ctt	gag	gtg	cta	aca	gaa	1488
Val	Arg	Tyr	Asp	Leu	Val	Thr	Leu	Asn	Leu	Leu	Glu	Val	Leu	Thr	Glu	
				485					490					495		
gct	gat	gcg	aaa	gcc	acg	ggg	cct	ggc	gta	tgg	acg	gcg	cgt	ttg	gag	1536
Ala	Asp	Ala	Lys	Ala	Thr	Gly	Pro	Gly	Val	Trp	Thr	Ala	Arg	Leu	Glu	
			500					505					510			
cat	gcg	ctg	cgg	att	gtg	tgc	aag	cgt	gcg	cgt	gat	cgc	ctc	acc	gat	1584
His	Ala	Leu	Arg	Ile	Val	Cys	Lys	Arg	Ala	Arg	Asp	Arg	Leu	Thr	Asp	
			515				520					525				
att	cgc	ccg	gtt	gcg	ccg	atg	att	gcg	ccg	cgt	agc	gaa	att	ggg	ttg	1632
Ile	Arg	Pro	Val	Ala	Pro	Met	Ile	Ala	Pro	Arg	Ser	Glu	Ile	Gly	Leu	
	530					535					540					
gtg	gaa	cgc	gat	ggc	gtg	ttc	aca	gtg	caa	tgg	cac	ggc	gaa	gac	tta	1680
Val	Glu	Arg	Asp	Gly	Val	Phe	Thr	Val	Gln	Trp	His	Gly	Glu	Asp	Leu	
545					550					555					560	
cat	cgg	att	ctt	ggc	gta	att	tat	gcc	aaa	gga	tgg	aca	atc	acc	gcg	1728
His	Arg	Ile	Leu	Gly	Val	Ile	Tyr	Ala	Lys	Gly	Trp	Thr	Ile	Thr	Ala	
				565					570					575		
gcg	cgc	atg	ctg	gcc	aat	ggg	caa	tgg	agt	gcg	gaa	ttt	gat	gtc	cgc	1776
Ala	Arg	Met	Leu	Ala	Asn	Gly	Gln	Trp	Ser	Ala	Glu	Phe	Asp	Val	Arg	
			580					585					590			
gca	aac	ggc	ccc	caa	gat	ttt	gat	ccg	cag	cat	ttc	ctg	cag	gca	tat	1824
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Gln	Ser	Gly	Val	Phe	Ser	Glu	Val	Pro	Ile	Pro	Ala	Pro	Gly	Ile	Thr	
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Thr	Gly	Ala	Ile	Phe	Ala	Leu	Leu	Arg	Thr	Leu	Pro	Asp	Ala	Leu	Trp	
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atc	aac	gct	gtg	acc	cgc	ggg	gcg	acc	ctg	att	atc	cag	gca	gca	ctg	2016
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Lys	Pro	Gly	Phe	Asp	Arg	Ala	Thr	Val	Glu	Arg	Ser	Val	Val	Arg	Ser	
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<400> 24

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Leu	Ile	Leu	Ile	His	Pro	Pro	Gly	Ala	Thr	Pro	Asp	Gly	Val	Glu	Asp	
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Leu	Trp	Tyr	Pro	Ile	Trp	Asp	Ala	Lys	Lys	Arg	Leu	Asp	Tyr	Ser	Val	
	65				70					75					80	
Arg	Thr	Pro	Asp	Glu	Cys	Val	Ala	Met	Ile	Ser	Ala	Asp	Ser	Thr	Ala	
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Ala	Leu	Ala	Met	Leu	Asp	Leu	Arg	Phe	Ile	Ala	Gly	Asp	Glu	Asp	Leu	
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Cys	Ala	Lys	Thr	Arg	Arg	Arg	Ile	Val	Glu	Lys	Trp	Arg	Gln	Glu	Leu	
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Asn	Lys	Asn	Phe	Asp	Ala	Val	Val	Asp	Thr	Ala	Ile	Ala	Arg	Trp	Arg	
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Arg	Ser	Gly	Pro	Val	Val	Ala	Met	Thr	Arg	Pro	Asp	Leu	Lys	His	Gly	
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His	Leu	Cys	Asn	Val	Pro	Gln	Leu	Asp	Thr	Gln	His	Gln	Leu	Leu	Leu	
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Phe	Arg	Ile	Leu	Ser	Ser	Pro	Lys	Asn	Ser	Arg	Arg	Val	Val	Lys	Asn
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Val	Arg	Tyr	Asp	Leu	Val	Thr	Leu	Asn	Leu	Leu	Glu	Val	Leu	Thr	Glu
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His	Arg	Ile	Leu	Gly	Val	Ile	Tyr	Ala	Lys	Gly	Trp	Thr	Ile	Thr	Ala
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Ala	Arg	Met	Leu	Ala	Asn	Gly	Gln	Trp	Ser	Ala	Glu	Phe	Asp	Val	Arg
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Gln	Ser	Gly	Val	Phe	Ser	Glu	Val	Pro	Ile	Pro	Ala	Pro	Gly	Ile	Thr
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Thr	Gly	Ala	Ile	Phe	Ala	Leu	Leu	Arg	Thr	Leu	Pro	Asp	Ala	Leu	Trp
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Ile	Asn	Ala	Val	Thr	Arg	Gly	Ala	Thr	Leu	Ile	Ile	Gln	Ala	Ala	Leu
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Leu	Ala	Gly	Ser												
	690														